



K.1 Significant Differences Between Versions 5.0 and 4.1

1. The most significant difference between the two versions is the generalization of moving grid capability and the added capability to handle sliding patched interfaces.
2. The viscous wall boundary condition now sets wall temperature locally rather than globally.
3. The capability to output control surface information and turbulence quantity information has been added.
4. There are slight differences in how the $k - \omega$ wall boundary conditions are set internal to the code (the new way is more “correct”). This change may result in very small differences in convergence, but the end result should be nearly identical to the old way.
5. The Baldwin-Lomax model can be applied on **jdim/kdim/ldim** bodies now.
6. In 2-d, the “far-field point-vortex correction” boundary condition can now be applied. Set **i2d** = -1, in combination with 1003.
7. A few more boundary conditions have been added.
8. Several more turbulence models have been added. Also, the “SSTZ” version of the SST $k - \omega$ model has been removed.
9. A crude wall function capability has been added.
10. Some very minor differences, which may result in nearly insignificant differences between Version 4.1 and Version 5.0 results, are:
 - (a) For the Wilcox $k - \omega$ model, Version 5.0 limits the production term in the k equation to be less than 20 times the destruction term. Version 4.1 does not.
 - (b) In Version 4.1, the input alpha and beta angles (in degrees) are transformed to radians by dividing by 57.2958. In Version 5.0, the transformation (using parameter **radtodeg**) is more precise.
11. Both the input file and the restart file are different. See the following section for details on the differences in the input file. Any existing Version 4.1 input file or restart file can be automatically transformed to a Version 5.0 file by using **v4tov5_input.f** or **v4tov5_restart.f**, located in the **tools** directory. (See “The Code and Supplementary Files” on page 9.)

K.2 Summary of Changes to the Input File

Version 5.0 of CFL3D originated when the generalization of moving grid capability (including sliding patched interfaces) was added to Version 4.1. As a consequence, the method for controlling the movement of any dynamic grids, patched or not, is now controlled from a new “section” at the end of the input file. Other than this, most changes to the input file, for either improved clarity or added capability, are relatively minor. After obtaining Version 5.0 of CFL3D, veteran users may notice some minor differences from Version 4.1. For those changes involving new input parameters, be sure to read about them in Chapter 3. Any existing Version 4.1 input file can be automatically transformed to a Version 5.0 input file by using `v4tov5_input.f`, located in the **Tools** directory. (See “The Code and Supplementary Files” on page 9.)

In the following, note that sample numerical values, which of course are case dependent, are included.

1. Line Type Three changed from

XMACH	ALPHA	BETA	REUE,MIL	TINF,DR	ISND	C2SPE
0.8750	00.000	0.0	02.660	460.0	0	0.0

to

XMACH	ALPHA	BETA	REUE,MIL	TINF,DR	IALPH	IHIST
0.8750	00.000	0.0	02.660	460.0	0	0

(Note: **isnd** and **c2spe** now handled by **Twtype** in the boundary condition section.)

2. Line Type Five changed from

	DT	IREST	IFLAGTS	FMAX	IUNST	RFREQ	ALPHAU
CLOC	-02.000	0	000	05.0000	0	0.39600	0.22200
0.50000							

to

	DT	IREST	IFLAGTS	FMAX	IUNST	CFLTAU
-02.000	0	000	05.0000	0	10.	

(Note: Unsteady grid motion is now handled in Line Types Thirty-Three through Fourth-Five)

3. Any boundary condition (Line Types Fourteen through Nineteen) with viscous wall (**bctype** 1004) changed from

1	1	1004	0	0	0	0	0
---	---	------	---	---	---	---	---

to

1	1	2004	0	0	0	0	2
	TWTYPE	CQ					
	0.	0.					

4. The 1-1 blocking section of the input file has been modified so that the parameter names are more pertinent and so that the bookkeeping of 1-1 interfaces is simplified. Line Types Twenty-Four through Twenty-Seven have been changed from

```

1-1 BLOCKING DATA:
NBLI
2
NBLON    NBLK(1)    NBLK(2)
0         1         1
0         3         4
LIMBLK(1) LIMBLK(2) LIMBLK(3) LIMBLK(4) LIMBLK(5) LIMBLK(6) ISVA(1,1)
ISVA(1,2)
1         1         1         2         41         1         1         2

```

```

          1          1          1          2          63          1          1          2
    LIMBLK(1) LIMBLK(2) LIMBLK(3) LIMBLK(4) LIMBLK(5) LIMBLK(6) ISVA(2,1)
ISVA(2,2)
          1          257          1          2          217          1          1          2
          1          1          51          2          63          51          2          3

```

to

```

1-1 BLOCKING DATA:
  NBLI
    2
NUMBER  GRID      :   ISTA   JSTA   KSTA   IEND   JEND   KEND   ISVA1   ISVA2
  1      1          :       1     1     1     2     41     1     1     2
  2      3          :       1     1     1     2     63     1     1     2
NUMBER  GRID      :   ISTA   JSTA   KSTA   IEND   JEND   KEND   ISVA1   ISVA2
  1      1          :       1    257     1     2    217     1     1     2
  2      4          :       1     1    51     2     63     51     2     3

```

The parameter **nblon** is no longer used (it is always 0). The values for **nblk(1)** and **nblk(2)** are now assigned under **grid** in Line Types Twenty-Five and Twenty-Six, respectively. The parameter **number** is intended to help the user keep track of interface numbers. This is particularly useful when there are a very large number of 1-1 interfaces. This parameter is not used internal to the code.

5. After **nprint** section, the following Line Types (Thirty-One and Thirty-Two) must be added:

```

CONTROL SURFACE:
NCS
0
GRID ISTART   IEND   JSTART   JEND   KSTART   KEND   IWALL   INORM

```

These lines (in combination with **ihstry**) control output of control surface information, such as mass flow. (Note: When using a control surface for print out, then **ncs** 0 and there will be at least one additional line under **grid**...)

6. The above items 1 - 5 are all that are *necessary* to transform an existing Version 4.1 input file (with non-moving grid) to a Version 5.0 input file. For a moving grid, Version 5.0 now has the additional section Line Types Thirty-Three through Forty-Five, required if and only if **iunst** > 0.

